

Highly Efficient Electrochemical Cryogenic Purge Gas Recovery System, Phase I

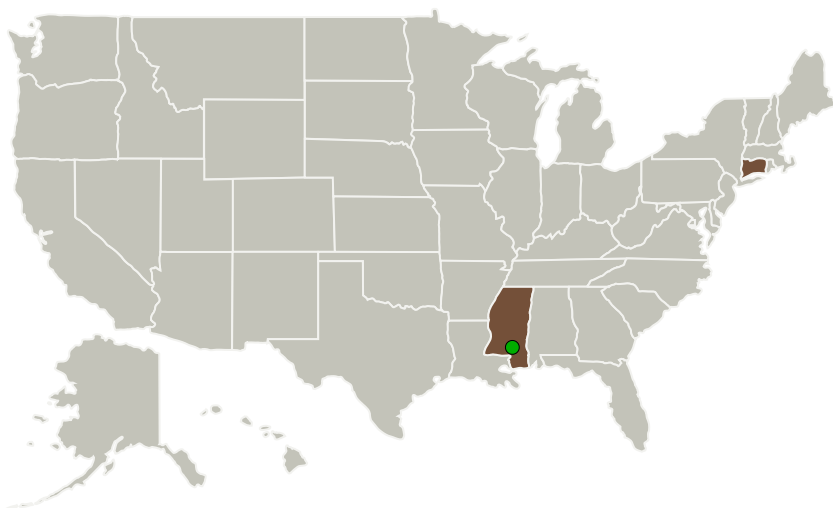
Completed Technology Project (2015 - 2015)



Project Introduction

Ongoing rocket test operations at NASA Stennis Space Center (SSC) result in substantial quantities of hydrogen gas that is flared from the facility in addition to valuable helium gas that is vented to the atmosphere. One method that can dramatically reduce the cost of test operations is to recover these gases using an electrochemical process. A Hydrogen Recovery System (HRS), which has recently been the subject of a highly successful Phase II SBIR conducted by Sustainable Innovations, LLC, selectively removes hydrogen from the mixed stream, leaving behind the high-value helium. In 2014 a prototype unit was successfully delivered by Sustainable Innovations to SSC to demonstrate the ability to capture, separate and compress helium from a mixture derived from test operations. The innovative step in this Phase I proposal is to increase the gas capacity capability of the electrochemical separation cell while maintaining optimal operating efficiency and durability. This will be achieved by: Implementing high electrical conductivity, high durability coatings on cell components that support operation in the hydrogen environment; Evaluating and demonstrating robust, high strength, high conductivity proton exchange membrane materials that support the separation process; and Integrating all elements within a one-piece flow field structure to minimize interfaces and facilitate coatings. It is expected that these innovative steps will allow for at least a doubling of throughput capacity per unit cell area.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Sustainable Innovations, LLC	Lead Organization	Industry	East Hartford, Connecticut
Skyre Inc	Supporting Organization	Industry Small Disadvantaged Business (SDB)	
● Stennis Space Center(SSC)	Supporting Organization	NASA Center	Stennis Space Center, Mississippi

Primary U.S. Work Locations

Connecticut	Mississippi
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Project Transitions

**June 2015:** Project Start**December 2015:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138952>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Sustainable Innovations, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

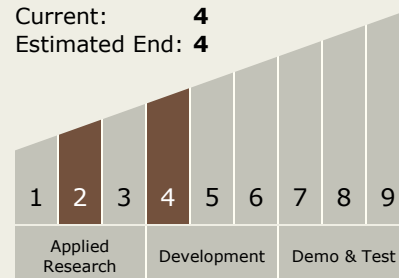
Joshua Preston

Technology Maturity (TRL)

Start: 2

Current: 4

Estimated End: 4



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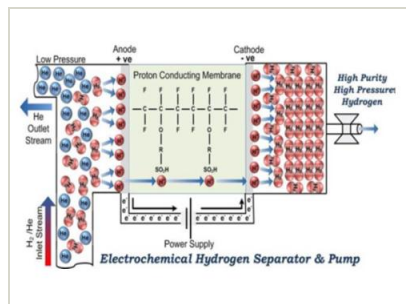
Images



Briefing Chart

Highly Efficient Electrochemical Cryogenic Purge Gas Recovery System Briefing Chart

(<https://techport.nasa.gov/image/126104>)



Final Summary Chart Image

Highly Efficient Electrochemical Cryogenic Purge Gas Recovery System, Phase I Project Image
(<https://techport.nasa.gov/image/134774>)

Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
 - └ TX13.1 Infrastructure Optimization
 - └ TX13.1.1 Natural and Induced Environment Characterization and Mitigation

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System